

# Restoration Guide for Historic Log Buildings on the Trail of Tears National Historic Trail

National Park Service  
Trail of Tears National Historic Trail  
MTSU Center for Historic Preservation



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For information about the NPS National Trails Intermountain Region, and the various trails it administers, including the Trail of Tears National Historic Trail, please access: <http://www.nps.gov/orgs/1453/index.htm>.



The Center for Historic Preservation joins with communities to interpret and promote their heritage assets through education, research, and preservation.

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## Introduction

Historic log buildings are one of the most iconic examples of early vernacular architecture in the Southeast. In the early nineteenth century, logs served as a favored construction material for both European Americans and Cherokees. Log cabins and sheds could be built with a minimum amount of local materials, labor, and knowledge, but more substantial hewn-log houses and barns required sophisticated carpentry skills, specialized tools, and manufactured items for their completion. These historic log buildings now stand as testaments to the skill of these early craftsmen.

A number of hewn-log buildings remain scattered along the Trail of Tears National Historic Trail. Some are former Cherokee homes and mark the beginning of the Trail of Tears, while others were built by European-Americans and bore witness to the removal. These carefully constructed buildings are often instantly recognizable, but there are many others that escape notice because their distinctive characteristics have been removed or remain hidden by exterior siding or newer additions. A dwelling that appears to follow a formal academic style may have a much earlier log house at its core, patiently awaiting discovery.

To help owners become better stewards of this architectural legacy, the Center for Historic Preservation at Middle Tennessee State University partnered with the National Trails Intermountain Region of the National Park Service to develop this guide. It offers advice and solutions regarding the restoration and preservation of historic log structures by addressing common problems faced by homeowners and construction/preservation professionals.



*The Bell detachment disbanded near the ca. 1834 Latta House (Vineyard Post Office) on January 7, 1839. The two-story, double-pen log house was moved from its original location to the Prairie Grove Battlefield State Park in Washington County, Arkansas, in 1958.*





*Cherokee James Vann built this two-story hand-hewn log tavern around 1805. It has a single room on the first floor and three rooms on the second floor accessible by an external staircase at the rear. A one-story board-and-batten room was added to the east side at a later date. The tavern was moved to the New Echota State Historic Site in Gordon County, Georgia, in 1955.*

## **Log Buildings on the Trail of Tears**

*Amy M. Kostine*

*“More and more as time goes on, [the log cabin] will be recognized as a symbol of the pioneer life which shaped America.”*

*– John Charles Campbell, 1912*

Over 100 years after Campbell made this statement, the log house continues to be an emblem of early settlement and a marker of migration patterns across North America. The Trail’s historic log structures are the result of a variety of log building techniques born from a melting pot of European influences but rooted in Scandinavian and German traditions. Some of the first log homes in the present-day United States appeared in the Delaware River Valley in the 1630s and were built by Swedish and Finnish settlers. Later, German immigrants brought their knowledge of log construction to the eastern Pennsylvania region. Other ethnic groups, such as the English and Scotch-Irish, quickly adopted this favored building technique.

At a time when settlers had little but natural resources at their disposal, building with logs was an ideal and efficient construction method. Trees that needed to be cleared from the land to make way for agricultural production could be turned into sturdy homes with minimal labor and tools. At first, settlers would typically build simplistic log cabins at their new homesteads. These temporary cabins were often made of round logs and had dirt floors. Some lacked chimneys and windows. The log cabin would soon give way to the more elaborate hewn-log house with wood floors, stone or brick chimneys, windows, and porches.

The tradition of log building quickly spread into the Upland South and the Ozarks with the migration of settlers into the region, influencing yet another major ethnic group: Native Americans. According to Patricia Irvin Cooper, author of “Cabins and Deerskins: Log Building and the Charles Town Indian Trade,” deerskin traders in South Carolina introduced the Cherokee and other native peoples to log buildings. Soon, many Cherokee abandoned their traditional wattle-and-daub dwellings and replaced them with log homes. By 1825, the transition was fully evident. Missionary Samuel Worcester observed, “The houses of the Cherokee are of all sorts, from an elegant painted or brick mansion, down to a very mean cabin. If we speak, however, of the mass of the people, they live in comfortable log houses generally one story high, but frequently two; sometimes of hewn logs, and sometimes unhewn; commonly with a wooden chimney, and a floor of puncheons.” In 1838, some of the Cherokee carried their knowledge of log building with them on the Trail of Tears and built their new homes in Indian Territory (present-day Oklahoma) using hewn logs.



*Born in Tennessee, Sequoyah, the creator of the Cherokee syllabary, built this single-pen hand-hewn log house in 1829 in present-day Sequoyah County, Oklahoma.*



*The Fort Morrow Blockhouse in Polk County, Tennessee, is the only known example of cantilevered log architecture on the Trail of Tears.*

Today, a number of log buildings survive along the Trail of Tears National Historic Trail. These buildings have endured on the landscape for over 175 years and represent a variety of different log house types. The most basic type consists of four log walls notched in the corners and is known as a single-pen (or single-crib when referring to barns and outbuildings). These small houses typically measure 20 by 18 feet, rest on a stone pier foundation, and have a chimney on one of the gable ends. More complex log dwellings evolved from the single-pen house with the attachment of additional pens. For example, a saddlebag house consists of two pens separated by a shared chimney; a dogtrot has two pens connected by a central breezeway, all sharing a common roof.

One of the most distinguishing features of a log house is its corner notch. Notches locked the logs in place, thus ensuring the structure's stability. The most commonly seen notch types on log buildings along the Trail of Tears National Historic Trail are square, V, and half-dovetail. Half-dovetail notches offer the most stability of the three. The square notch offers the least, as it does not allow the logs to lock in place; structures built with this notch type are significantly less stable and more susceptible to collapse.

Time has not always been kind to the log house. Many suffered from neglect, fire, and environmental threats over the years, leading to their destruction and collapse. The log buildings that remain along the Trail of Tears today represent only a fraction of how many were standing in 1838. These log buildings are not just tangible reminders of the removal landscape, but are also important examples of the vernacular architecture of early America and visual representations of the turning point in the traditional architectural practices of the Cherokee.





*The Wolf House in present-day Norfolk, Arkansas, was built in 1829 and is an excellent example of a two-story dogtrot log building. It was the first permanent courthouse for Izard County in Arkansas Territory. Those traveling with Benge's detachment would have seen this building on their way to Indian Territory.*



*(Left) Square notch, ca. 1836 corn crib at the Crider Tavern Complex in Caldwell County, Kentucky; (center) V-notch, ca. 1810 outbuilding at the George A. West Complex in Robertson County, Tennessee; (right) Half-dovetail notch, ca. 1805 Vann's Tavern in Gordon County, Georgia.*

## Restoration Problems and Solutions

*Michael T. Gavin*

Before beginning work on a historic building, it is a good idea to perform a thorough physical inspection of the structure. Part of this investigation should include taking photographs of any specific problems that are found in order to have points of reference for future repairs. Knowledge of the history of the building, such as construction dates, owners, function, whether the structure was moved or not, etc., also can prove to be valuable.

Remember that it is best not to move a log building from its original location unless it is necessary to ensure its preservation. Consulting with a historic preservation professional at the beginning of a restoration project is advisable. The solutions for many problems can be worked out in advance and costly miscues prevented, allowing workers to do the job right the first time.

### Foundation

The foundation should be the starting point for any restoration project because problems found there will affect all other parts of the structure. Most foundations of log and other kinds of folk buildings were built close to the ground and rested on either rows of rock, wooden piers, or a continuous fieldstone foundation. Often, infill was placed between these supports to keep animals out. Basements usually are found only under the earliest houses.





Log structures in warm climates were set on piers in order to allow air to circulate underneath. This air circulation kept the house cooler and helped keep wooden components (particularly sills and joists) from rotting. If infill was added between the piers air circulation decreased, making deterioration of the sills, joists, and lower logs more likely.

**Problem:** Silt Deposits. Because carpenters often built on hillsides, waterborne soil tended to be deposited either against or under these structures over the years. Moist dirt accumulation close to building components often resulted in foundation decomposition.

**Solution:** Remove loose soil so that there is at least 16 inches of clearance between the earth and the wooden building components. Grade the area around the structure so that rainwater flows away from it.

**Problem:** Settling. Settling occurs when the soil is unable to bear the load placed upon it or when the weight of the structure is concentrated in too small an area. The result is the unplanned movement of the building, which can lead to the cracking or tearing of finish materials and, in extreme cases, structural failure.

**Solution:** Install a concrete footing under the affected pier. A 12-inch-thick pad should extend at least six inches on all sides past the edge of the pier it supports. The bottom of the footing should rest below the frost line. In order to support the sill temporarily, set the cribbing back so that it is out of the way of the work. After establishing the proper height for the top of the foundation, remove the rocks of the existing pier and excavate the dirt where the footing will be placed. Lay in several pieces of half-inch rebar if the bearing soil is unstable. Pour and level concrete. Lay up the rock and level the sill with wood shims. For a more ambitious plan of replacing (or installing) a continuous foundation, the procedure above can be used for one section at a time.





## Sills

These large, square-hewn beams, usually at least 12"x12", lay on top of the foundation. The sills supported the entire house, particularly the first floor joists, the door bucks, and the end logs. Builders usually chose wood capable of bearing a heavy load, such as white oak, for the sills.

**Problem:** Deterioration at Bearing Points. The sill shows signs of rotting where wood and rock meet.

**Solution:** Because a rock laid directly on the ground will transfer dampness to wood resting on it, the piers themselves must be at least two rocks high in order to provide a moisture break. A metal moisture barrier can also be inserted between the masonry and wood.

When only a section of the sill needs replacement, carefully remove all the deteriorated wood, leaving a rectangular cavity. Measure the cavity and fashion a new piece out of the same species with the grain running the same way. Install the piece with glue and appropriate hardware as needed. If the sill is exposed, stain the repaired section to match the rest of the piece.

**Problem:** General Deterioration. Large sections of the sill have rotted.

**Solution:** Identify the sources of the moisture causing the deterioration. If rainwater falling from the roof is the cause, install half-round gutters with down-spouts and leaders to direct water away from the foundation. If the sill is too close to the ground, the building may need to be jacked up into a new position before the floor system can be replaced. If the sill has lost its structural integrity and is no longer able to bear its load, it must be replaced entirely. In order to do so, the floor joists first need to be temporarily supported. After obtaining a new timber, place a large temporary beam under the joists a few feet from the old sill and jack it up to bear the joists. After the beam is raised, the old sill can be safely removed and the new one installed.

Either decay-resistant wood, such as red cedar, or pressure-treated timber should be used as the replacement. After the new sill has been put into position, remove the temporary beam and attach the floor joists to the new sill.

## Floor Joists

The most common floor joists used in historic log structures were whole trees approximately 12" in diameter and often debarked and flattened slightly at the top in order to accommodate the flooring. Commonly called sleepers, these timbers had half-lapped joints at each end that allowed them to rest solidly on the sills. The sleepers were not fastened to the sills; gravity and the flooring boards nailed to them kept them in place.

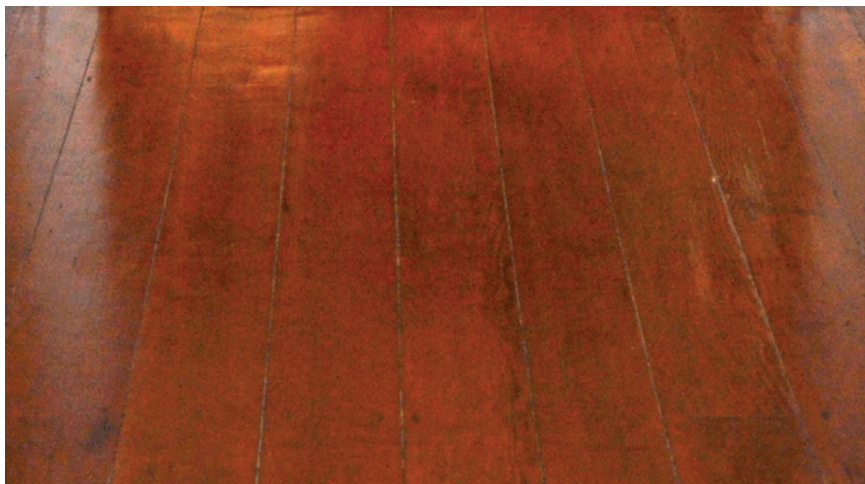
Builders of later log houses used hewn or sawed floor joists of dimension lumber to frame the floors. The carpenters either mortised the joists into the sills or merely nailed them. Some owners replaced the sleepers and early flooring with sawmill products at a later time.

**Problem:** General Deterioration. Joists are susceptible to failure from the same causes that affect sills.

**Solution:** There are two ways to access the floor joists: from the top and from the bottom. If there is enough ground clearance, the easiest and least obtrusive repairs can be made from underneath the structure. When the floor system is too close to the ground to work from below, repairs must be done from above. The flooring should be carefully removed if not too deteriorated and then reused if possible. Unless there is a minimum of 16" of clearance beneath the joists, they should be made of pressure-treated wood or a species that is decay resistant. Broken or undersized material can be left in place with new stock aligned next to it and fastened properly. Older joists can be strengthened by placing (perpendicularly) a short, well-nailed piece of pressure-treated 2"x4" on one side near the middle of the joist so that it touches the ground. The addition of this simple "leg" effectively halves the span.







## Flooring

The earliest type of flooring that appeared in log construction was known as puncheon. Puncheons were short, thick, split or hewn-log pieces of timber roughly finished on one or more surfaces and often laid directly on the ground. As time went on, puncheons were replaced by 1¼"–thick boards, tongue-and-grooved and planed by hand.

White ash was usually selected for the first floor because of its strength and durability, and yellow poplar was often employed upstairs. Yellow poplar is lighter and more easily worked, suitable for the second floors, which received considerably less wear than those downstairs. Using a special plane, early carpenters often formed a bead along the underside of each second-story floorboard that provided some minimal decoration in the room below.

**Problem:** Wear and Tear. Regardless of material, flooring wears out and must be replaced sooner or later. If one is fortunate enough to have a house that has its original flooring, it is usually worth the time and effort to restore and maintain it.

**Solution:** Quite often, minimal repair coupled with a thorough cleaning with tung oil and water will suffice. Avoid sandblasting, using linseed oil, extreme pressure-washing, scraping, drum or disk sanding, and other destructive techniques. Minimize wear by using a protective, removable rug or plastic covering in high traffic areas. If the whole floor needs to be replaced, an adequate plywood is chosen and will last through future replacements. A strong subfloor means that difference in materials are not an issue and finished flooring can be laid in any direction.

## Wall Logs

In building temporary log cabins, almost any kind of tree would do. For permanent hewn-log houses, however, carpenters selected similarly sized, decay-resistant trees of a single species such as yellow poplar, red cedar, hemlock, chestnut, or black walnut. Although white oak was put to use early in the settlement period, builders found yellow poplar to be the best choice overall because of its size, weight, and workability and its tendency to withstand rot and insects.

The most important structural feature of a log house is the notching that locks the logs together at the corners. Much of the weight of the building is borne by the corners, so it is essential to protect them from deterioration. If the notches fail, the log house will fail. Historically, different types of this corner timbering have been used; the half-dovetail, V, and square notches are the most common ones found along the Trail of Tears.

**Problem:** Deteriorated Log End. The end of the log can no longer bear the weight upon it.

**Solution:** Carefully remove all deteriorated wood near the end of the log. Form a small piece of wood into the shape of the wood that was removed, and insert the formed wood block into the space.

**Problem:** Deteriorated Log End. The end of the log can no longer bear the weight upon it, but concern for appearance prohibits the use of wood block repair.

**Solution:** Inject a sufficient amount of a two-part epoxy compound into the end of the log. Complete the form of the notch with the paste-like material. This is a very expensive repair and should be used for projects where appearance or authenticity is especially important.





**Problem:** Minor Deterioration of Log. Deterioration of wall logs, particularly lower logs and logs near fireplaces, is not unusual. Although some species of wood, such as red cedar and yellow poplar, are highly resistant to decay, all wood will rot eventually.

**Solution:** Logs can be repaired using the same methods used in sill repair. For additional protection, apply exterior coatings to all surfaces that are exposed to weather. These products are available from log home suppliers.

**Problem:** Log Failure. Log replacement is more difficult. The choices are either an older log from a historic building that no longer retains integrity or a new one from a sawmill. The longer the log needed, the more difficult it is to find. An older log must be cut to length and notched; a new one must be cut, notched, and hewed. The entire affected wall, as well as part of the second floor and the room, must be temporarily supported while repairs are made. Due to the complexity and danger of this work, only experienced professionals should undertake such a project.

## Chinking and Daubing

The space between the logs (known as chinks) traditionally were made weathertight with chinking (short wooden billets and/or small stones) covered with daubing (a mixture of clay, sand, lime, and animal hair). On the interior, planed beveled boards often covered the chinks.

More modern techniques include the use of amended mixtures over metal lath and a number of patented formulas of plastic daubing applied to insulation board. Chinking and daubing requires continuous monitoring to identify small defects and prevent serious problems from developing.

**Problem:** Poor Appearance. The daubing is discolored and numerous small cracks mar the finished surface.



**Solution:** If the chinking and daubing are relatively solid, it may be enough to renew the surface with a special coating available from vendors who sell log home products. It is available in a variety of colors. This material fills cracks in the daubing (if not too large) and results in a fresh appearance.

**Problem:** Broken and/or Missing Daubing. Cracked or missing daubing can cause potentially damaging exposure to weather.

**Solution:** Remove all daubing that is not solidly affixed to the chinking and brush away all dust. Make sure all chinking is firmly in place and fill in where needed. Either traditional chinking or expanded metal lath can be used. After moistening the area to be worked on, use a mixture of one part Portland cement, four to eight parts lime, and seven to ten parts sand to fill in the empty spaces.

**Note:** It is important to apply protective coating to the logs (if desired) before the chinking and daubing are installed.



**Problem:** Large-scale Failure of Chinking and Daubing. Advanced deterioration has made the chinking and daubing unattractive and unable to repel wind and water.

**Solution:** Remove all deteriorated chinking and daubing and install new material using the methods detailed above. Another option is to install a plastic daubing designed for use on log buildings. This daubing must be applied evenly over a plastic, foam-type insulation board. When dried, the daubing will adhere to the log on either side yet slide over the backer board so that it does not tear. This method is user-friendly; the only tools needed are a hot knife, a plant sprayer, a pastry bag, and variously sized spatulas. The backer board should be installed at a slight outward slant so that the top is recessed under the upper log and the bottom is almost flush with the lower one. This will allow rainwater to run off properly.



## Loft Joists

A series of large timbers, each at least 3"x8" and borne by carefully selected logs in the front and rear walls, were used to support the upper floor of a log house. Usually these joists were sawed or hewed into rectangular form, but occasionally they were left round. The ends of the joists were mortised into the bearing walls. In the early houses, beads were fashioned on the bottom edges of the joists as a decorative element.

**Problem:** Sagging or Shaking Floor. Historic loft joists rarely are able to bear the heavy loads that modern living requires.

**Solution 1:** If there is to be a ceiling below, each joist can be reinforced by attaching either another joist or a steel plate to its side. If the first floor ceiling is to remain open with exposed joists, another method must be used.

**Solution 2:** After the lost floor has been carefully removed, fashion a narrow three-inch-deep slit in the top of each joist along its entire length. Insert a full-length T-shaped angle iron tightly into each slit and fasten securely. Then reinstall the flooring.

## Plates

These large beams, square-hewn and at least 8"x12", rest at the top of the long walls in order to support the rafters. The plates needed to be massive enough in cross section to resist the outward thrust of the rafters, particularly in the middle of the building. Carpenters pegged these plates to the top log on each end wall, which was cantilevered about 12 inches, front and back, to support one of the plate ends. This extension formed an overhang that protected the wall beneath to some degree.

At times, carpenters borrowed a timber framing feature known as a false plate to support the rafter bases. They extended the ceiling joists a foot or so past the top log on which they rested. A one-inch-thick board (the false plate) was nailed to the top of the joists, and then the rafters were set on it and fastened. This method produced an overhang similar to the one described above.

**Problem:** Deterioration. These large timbers often suffer considerable damage caused by roof leaks.

**Solution:** Small areas of deterioration can be repaired using the same methods used in sill repair, but greater damage requires reinforcement or replacement. Steel plates and/or angle irons usually can be installed in places not exposed to view, such as the rear or top of the beam. Sometimes a portion of the beam must be removed to accommodate the steel reinforcement pieces.







## Roof

Generally, a roofing system is composed of three main parts: the framing (rafters), the substrate (sheathing boards), and the fabric (shingles or sheet metal). The rafters, made from small poles or 3" by 4" scantling, were nailed or pegged at the butt ends to either a large hewn top plate or a thin false plate. At the peak, each corresponding pair of rafters was either half-lapped and pegged together, butted against each other, or nailed to each side of a ridge pole. The shingles were nailed to wide unedged boards or narrower rived slats which had been fastened to the rafters. As the twentieth century progressed, many building owners began to replace their old wood-shingled roofs with corrugated or V-crimped galvanized sheet metal.

**Problem:** Worn-out Roof Covering. It is normal to replace roof fabric on a regular basis.

**Solution:** All log houses originally had some type of wooden shingles covering their roofs. Although installing a new wood-shingled roof is ideal and presents the most authentic appearance, it can be relatively costly. If cost is a concern, manufactured sheet metal panels or a well-maintained enameled sheet metal roof will provide many years of service at a fraction of the cost of wooden shingles, although it will not be as authentic in appearance.

**Problem:** Moss or Mold Growth on Shingles. Different types of vegetation grow on the shingles. Overhanging tree limbs shade the roof and allow various organisms to flourish there.

**Solution:** Keep leafy trees and shrubs away from buildings. Spray the roof with a weak solution of bleach and water to remove moss. If the problem persists, attach thin lead or copper plates to the peak of the ridge.

**Problem:** Loose Shingles. The sheathing cannot hold the nails for the shingles firmly enough.

**Solution:** Replace sheathing with lumber at least  $\frac{3}{4}$ " thick.

**Problem:** Undersized or Weakened Rafters. Lumber that appears to be sound may fail completely under increased stress.

**Solution:** Due to age, the wood in log buildings has lost much of its strength and resiliency. Rafters rarely are able to bear as heavy a load as when they were new. Each historic component should be examined thoroughly for deterioration, decay, or outright failure and repaired or replaced if necessary.

## Siding

Lapped wood siding (weatherboard) was used to protect the gable and other exposed areas of log houses from the weather. The early siding consisted of thick, rough, wooden planks, often split rather than sawed. As time went on, waterpowered sawmills began to produce thinner, tapered boards that fit tightly over one another. The price of lumber fell due to this mechanization, and many owners were able to cover their entire houses with beveled weatherboard relatively cheaply.

**Problem:** Deteriorated Siding. Worn siding admits weather to the building.

**Solution:** The original siding consisted of yellow poplar, which still can be found commercially. These days, lap siding is more commonly available in western woods (such as cedar, spruce, pine, and fir), which are acceptable substitutes. Replacement of worn or deteriorated lap siding should be done on a piece-by-piece basis. Carefully remove unusable pieces. The new siding should be nailed with noncorrosive fasteners. Lap each piece  $\frac{3}{4}$ " over the previous one and place the nails so that the top siding board is not fastened to the lower one.



**Problem:** Removal of Siding to Expose Logs. The majority of the structure's historic siding is removed for an "old-timey" appearance. This all-too-common practice can be extremely deleterious to the logs themselves and other historic building materials. Because the purpose of the siding was to protect the logs, chinking, and daubing, its removal allows deterioration to begin and continue.

**Solution 1:** Repair rather than remove historic wood siding.

**Solution 2:** Apply protective coating on logs. Specially formulated coatings for log structures are available from a number of manufacturers.

**Solution 3:** Uncover only the logs that are shielded by porches or additions, and protect the exposed logs with siding or water-resistant coatings.

## Doors

When the walls were completed, the carpenters sawed out openings for the doors and fireplace. Thick planks were selected for each vertical side of these openings and then nailed or pegged to each log that had been cut. The earliest type of door used in log houses consisted of a set of vertical planks held together by three shorter, equally-spaced, horizontal planks nailed to them. This simple arrangement was known as a batten, or pioneer, door. These plain doors often were replaced at a later date by raised-paneled doors made in a millwork shop. Doors made from modern materials also have found their way into folk houses over the years.

**Problem:** Deteriorated, Broken, or Missing Doors. Original doors are unsuitable for modern use.

**Solution:** If possible, the original doors should be refurbished and used. Historic doors are often too small to meet modern building codes and may need to be replaced or lengthened. The guiding principle to follow when selecting substitutes is one of appropriateness. Energy-efficient doors that have the proper historic appearance are available from a number of suppliers or can be made in a local woodshop.



## Windows

The early houses had few, if any, windows and those that did employed wooden shutters or blinds to keep out the weather until glass became available. Sash windows that slid horizontally and needed no hardware could be found in some dwellings. The 4/4 vertical double-hung window is the most common type added to log buildings, although a small, single-sash, casement-like window often appears on the upper gable ends of the house.

**Problem:** Deteriorated Windows. Original windows are unsuitable for modern use.

**Solution:** Rebuilding the original windows is the preferred option. Historic windows and frames were rarely complex and can be repaired fairly easily. The installment of unobtrusive storm windows can significantly reduce heating and cooling costs; so can the use of insulated glass.

## Fireplace

The first fireplaces of log houses often were built like the houses themselves. A small rectangle of notched logs was built up to breast height, and the inside was lined with large flat rocks and clay. Then a chimney was constructed out of sticks and clay, which was known as a catted chimney.

Eventually, these log fireplaces with their wooden chimneys were replaced with more substantial ones of brick or stone, laid up with a mud- or lime-based mortar. These masonry fireplaces were smaller than their wooden counterparts and a great deal safer.

**Problem:** Using an Old Fireplace. Several important safety concerns should be dealt with regarding historic fireplaces.





**Solution:** Any fireplace should be inspected before it is lit for the first time. Often, birds or other creatures make nests out of flammable materials, and this situation could cause a fire if not detected in advance. Also, few fireplaces had dampers that would prevent most of the heat from going up the chimney; fewer chimneys had liners that protected the adjacent wooden building components from catching fire. Both are necessary in a modern wood-burning fireplace, and either improvement can be installed by a number of qualified contractors.

**Problem:** Missing Mortar. The joints in the exterior masonry often need repointing because the original soft clay and lime mortar has disappeared in places.

**Solution:** Apply the mortar with a narrow trowel. Only use a soft, lime-based mortar for repointing. The use of Portland cement is not recommended because it will dry harder than the brick or stone. This will cause the masonry to crack during the normal cycle of expansion and contraction of the building materials.

**Problem:** Cracking of Masonry Due to Repointing with Portland Cement. Excessive Portland cement use often leads to the fracturing of bricks or stones.

**Solution:** Carefully remove old Portland cement from affected joints with a cold chisel and repoint with a softer lime-based mortar.



## Additional Information

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For additional technical assistance, contact your State Historic Preservation Office (SHPO): <http://www.nps.gov/nr/shpolist.htm>.

## Photo Captions

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